What is claimed is:

1. A method for measuring a radiation pattern and a gain of a radiator, comprising the steps of:

a) measuring powers of output port of a transverse electric and magnetic (TEM) waveguide by changing arrangements of the radiator located within the TEM waveguide; and

b) estimating a radiation power density of the radiator in free space, wherein the radiator is modeled as a dipole moment based on the powers of the output port of the TEM waveguide.

2. The method as recited in claim 1, further comprising the steps of:

c) measuring a power P_0 received by an antenna of the radiator based on a conducted power accepted by the radiator and a reflecting coefficient of an antenna of the radiator, and obtaining a maximum radiation power density P_D of a half-wave dipole antenna due to the power P_0 at a predetermined distance;

d) obtaining the maximum radiation power density P_{max} among the estimated radiation power densities;

e) obtaining a radiation gain of the radiator based on the maximum radiation power density P_{max} obtained in the step d)and the maximum radiation power density P_D obtained in the step d); and

f) obtaining an effective radiation power based on the maximum radiation power density P_{max},

wherein the maximum radiation power density P_D of a half-wave dipole antenna due to the power P_0 at a predetermined distance is obtained by an equation as:

$$P_D = \frac{P_O \cdot (\text{gain of half} - \text{wave dipole antenna measured in TEM waveguide})}{4\pi R^2}.$$

3. The method as recited in claim 2, further comprising the step of: computing a total radiation power (TRP) based on the estimated radiation power density.

4. The method as recited in claim 1, wherein said step a) includes the step of:

a1) putting the EUT coordinate axes X′, Y′ and Z′ to GTEM coordinate axes X, Y, Z, respectively, to thereby make a coordinate system (XX', YY', ZZ'), and measuring powers P_1 to P_5 of the output port of the TEM waveguide by rotating the EUT counterclockwise by 0°, 45°, 90°, 180° and 270° on Y-axis;

a2) putting the EUT coordinate axes X′, Y′ and Z′ to GTEM coordinate axes Y, Z, X, respectively, to thereby make a coordinate system (XY', YZ', ZX'), and measuring powers P_6 to P_{10} of the output port of the TEM waveguide by rotating the EUT counterclockwise by 0°, 45°, 90°, 180° and 270° on Y-axis;

a3) putting the EUT coordinate axes X′, Y′ and Z′ to GTEM coordinate axes Z, X, Y, respectively, to thereby make a coordinate system (XZ', YX', ZY′), and measuring powers P_{11} to P_{15} of the output port of the TEM waveguide by rotating the EUT counterclockwise by 0°, 45°, 90°, 180° and 270° on Y-axis;

a4) putting the EUT coordinate axes X′, Y′ and Z′ to GTEM coordinate axes X, Y, Z, respectively, to thereby make a coordinate system (XX', YY', ZZ'), measuring power P_{16} of the output port of the TEM waveguide by rotating the EUT counterclockwise by 45° on X-axis;

a5) putting the EUT coordinate axes X′, Y′ and Z′ to GTEM coordinate axes Y, Z, X, respectively, to thereby make a coordinate system (XY', YZ', ZX'), and measuring power P_{17} of the output port of the TEM waveguide is measured after rotating the EUT counterclockwise by 45° on X-axis; and

a6) putting the EUT coordinate axes X′, Y′ and Z′ to GTEM coordinate axes Z, X, Y, respectively, to thereby make a coordinate system (XZ', YX', ZY′), and powers P_{18} of the output port of the TEM waveguide by rotating the EUT counterclockwise by 45° on X-axis.

5. The method as recited in claim 4, wherein the radiation power density in free space is estimated based on the powers of the output port of the TEM waveguide by using an equation expressed as:

$$P(\theta,\phi)=\frac{15\pi}{r^2\lambda^2}\begin{pmatrix}\left[A+k_0{}^2D\right]\left[\cos^2\theta\cos^2\phi+\sin^2\phi\right]+\left[B+k_0{}^2B\right]\left[\cos^2\theta\sin^2\phi+\cos^2\phi\right]\\ +\left[C+k_0{}^2F\right]\sin^2\theta\\ -2\left[G+k_0{}^2J\right]\sin^2\theta\sin\phi\cos\phi-2\left[H+k_0{}^2K\right]\sin\theta\cos\theta\sin\phi-2\left[I+k_0{}^2L\right]\sin\theta\cos\theta\cos\phi\\ +2k_0[M-P]\cos\theta+2k_0[N-Q]\sin\theta\cos\phi+2k_0[O-R]\sin\theta\sin\phi\end{pmatrix}$$

where

$$A+k_0{}^2D=\frac{1}{4}\left(P_1+P_4+P_{11}+P_{14}-P_3-P_5+P_8+P_{10}+P_{13}+P_{15}-P_6-P_9\right)$$

$$B+k_0{}^2B=\frac{1}{4}\left(P_1+P_4+P_6+P_9-P_8-P_{10}+P_3+P_5+P_{13}+P_{15}-P_{11}-P_{14}\right)$$

$$C+k_0{}^2F=\frac{1}{4}\left(P_6+P_9+P_{11}+P_{14}-P_{13}-P_{15}+P_3+P_5+P_8+P_{10}-P_1-P_4\right)$$

$$G=P_{18}-\frac{(P_3+P_5+P_{11}+P_{14})+\sqrt{2}(P_3-P_5+P_{11}-P_{14})}{4}$$

$$J=\frac{4P_7-(P_6+P_8+P_9+P_{10})+\sqrt{2}(P_9-P_6+P_{10}-P_8)}{4k_0{}^2}$$

$$H=P_{16}-\frac{(P_1+P_4+P_8+P_{10})+\sqrt{2}(P_1-P_4+P_8-P_{10})}{4}$$

$$K=\frac{4P_{12}-(P_{11}+P_{13}+P_{14}+P_{15})+\sqrt{2}(P_{14}-P_{11}+P_{15}-P_{18})}{4k_0{}^2}$$

$$I=P_{17}-\frac{(P_6+P_9+P_{13}+P_{15})+\sqrt{2}(P_6-P_9+P_{13}-P_{15})}{4}$$

$$L=\frac{4P_2-(P_1+P_3+P_4+P_5)+\sqrt{2}(P_4-P_1+P_5-P_8)}{4k_0{}^2}$$

$$M=\frac{P_{15}-P_{13}}{4k_0{}^2}\quad P=\frac{P_4-P_1}{4k_0{}^2}\quad N=\frac{P_5-P_3}{4k_0{}^2}$$

$$Q=\frac{P_9-P_6}{4k_0{}^2}\quad O=\frac{P_{10}-P_8}{4k_0{}^2}\quad R=\frac{P_{14}-P_{11}}{4k_0{}^2}$$

6. The method as recited in claim 4, wherein the gain of the radiator is obtained by dividing the maximum radiation

power density P_{max} by the radiation power density P_D.

7. The method as recited in claim 4, wherein the effective radiation power (ERP) is obtained by multiplying the maximum radiation power density P_{max} by surface area of a sphere having a predetermined radius to generate a multiplied value, and dividing the multiplied value by a gain of the half-wave dipole antenna wherein the gain is measured in the TEM waveguide, which is expressed by an equation as:

$$ERP = \frac{P_{\max} \cdot 4\pi R^2}{\text{gain of half} - \text{wave antenna measured in TEM waveguide}}$$

8. The method as recited in claim 4, wherein the gain of half-wave antenna measured in TEM waveguide is about 1.64.

9. The method as recited in claim 8, wherein the TRP is obtained by integrating on the sphere having a predetermined radius for the radiation power density estimated in the step b), which is expressed by an equation as:

$$TRP = \int_{0}^{360^\circ} \int_{0}^{180^\circ} P(r,\theta,\phi) r^2 \sin\theta d\theta d\phi .$$